# METHOD, APPARATUS, AND PROGRAM FOR ENHANCING THE VISIBILITY OF DOCUMENTS

## BACKGROUND OF THE INVENTION

### 1.    Technical Field:

5   The present invention relates to data processing and, in particular, to document presentation.  Still more particularly, the present invention provides a method, apparatus, and program for enhancing the visibility of documents.

### 10   2.    Description of Related Art:

The worldwide network of computers commonly known as the "Internet" has seen explosive growth in the last several years.  Mainly, this growth has been fueled by the introduction and widespread use of so-called "Web

15   browsers," which enable simple graphical user interface-based access to network servers, which support documents formatted as so-called "Web pages."  These Web pages are versatile and customized by authors.  For example, Web pages may mix text and graphic images.  A

20   web page also may include fonts of varying sizes and colors.

A browser is a program that is executed on a graphical user interface (GUI).  The browser allows a user to seamlessly load documents from the Internet and

25   display them by means of the GUI.  These documents are commonly formatted using markup language protocols, such as hypertext markup language (HTML).  Portions of text and images within a document are delimited by indicators, which affect the format for display.  In HTML documents,

Docket No.    AUS920010686US1

the indicators are referred to as tags.  The browser gives some means of viewing the contents of web pages (or nodes) and of navigating from one web page to another.

5    The versatility and customization of web pages, however, is sometimes an impediment to users displaying the documents.  For example, documents, such as HTML documents, may allow the author to include a background image or color to be presented behind the document content.  However, some authors choose backgrounds and 10    colors that make the text blend into the background. Thus, when the document is presented on a display, the text may be difficult to read.

Some document viewers allow the user to define preferences for attributes of a document.  For example, a 15    user may be allowed to set a font typeface or size to define default attributes for documents that are displayed.  These preferences may be used to enhance the visibility and readability of text.  However, when attributes are explicitly specified, the explicit 20    attributes in the document cannot be overridden.  Thus, if the explicitly specified attributes render the document difficult to read, the user is helpless to change them.

Therefore, it would be advantageous to provide an 25    improved document viewer that enhances the visibility of documents.

Docket No.    AUS920010686US1

## SUMMARY OF THE INVENTION

The present invention provides a document viewer
with a clarification tool.  The document viewer may be a
Web browser and the clarification tool may be a plugin or
5    extension.  The clarification tool modifies the
attributes of the document to make the text more visible.
The manner in which the document attributes are modified
may be defined in user preferences.  For example, the
user may choose to modify the color of the text to a
10   predefined dark color or a predefined light color.  As
another example, the user may choose to remove the
document background color or image.  As a further
example, the user may choose to display an outline or
background around the text, such as white text on a black
15   background or black text with a white outline.  Other
user defined or predefined methods for clarifying the
text may also be used.

Docket No.   AUS920010686US1

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims.  The invention itself, however, as well as a preferred mode of

5  use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** depicts a pictorial representation of a

10  network of data processing systems in which the present invention may be implemented;

**Figure 2** is a block diagram of a data processing system that may be implemented as a server in accordance with a preferred embodiment of the present invention;

15  **Figure 3** is a block diagram illustrating a data processing system in which the present invention may be implemented;

**Figures 4A-4C** are example screens of display for a document viewer in accordance with a preferred embodiment

20  of the present invention;

**Figure 4D** is an example screen of display for a preferences dialog in accordance with a preferred embodiment of the present invention;

**Figures 5A-5C** illustrate example documents in

25  accordance with a preferred embodiment of the present invention;

**Figure 6** is an exemplary block diagram of a document viewing system with clarification in accordance with a preferred embodiment of the present invention;

Docket No. AUS920010686US1

**Figure 7** is a block diagram of a browser program in accordance with a preferred embodiment of the present invention; and

**Figures 8** and **9** are flowcharts illustrating the operation of a document viewer in accordance with a preferred embodiment of the present invention.

Docket No.    AUS920010686US1

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented.

5   Network data processing system **100** is a network of computers in which the present invention may be implemented.  Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers

10   connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, server **104** is connected to network **102** along with storage unit **106**.  In addition,

15   clients **108, 110,** and **112** are connected to network **102**. These clients **108, 110,** and **112** may be, for example, personal computers or network computers.  In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients

20   **108-112**.  Clients **108, 110,** and **112** are clients to server **104**.  Network data processing system **100** may include additional servers, clients, and other devices not shown.

In the depicted example, network data processing system **100** is the Internet with network **102** representing a

25   worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial,

30   government, educational and other computer systems that

route data and messages.  Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area

5     network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

Referring to **Figure 2,** a block diagram of a data processing system that may be implemented as a server, such as server **104** in **Figure 1,** is depicted in accordance

10    with a preferred embodiment of the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**. Alternatively, a single processor system may be employed.

15    Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**.  I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**.  Memory controller/cache **208** and I/O bus bridge **210** may be

20    integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**.  A number of modems may be connected to PCI local bus **216**.  Typical PCI bus implementations will

25    support four PCI expansion slots or add-in connectors. Communications links to clients **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide

30    interfaces for additional PCI local buses **226** and **228**, from which additional modems or network adapters may be

Docket No.    AUS920010686US1

supported.   In this manner, data processing system **200**
allows connections to multiple network computers.   A
memory-mapped graphics adapter **230** and hard disk **232** may
also be connected to I/O bus **212** as depicted, either
5  directly or indirectly.

Those of ordinary skill in the art will appreciate
that the hardware depicted in **Figure 2** may vary.   For
example, other peripheral devices, such as optical disk
drives and the like, also may be used in addition to or in
10  place of the hardware depicted.   The depicted example is
not meant to imply architectural limitations with respect
to the present invention.

The data processing system depicted in **Figure 2** may
be, for example, an IBM e-Server pSeries system, a
15  product of International Business Machines Corporation in
Armonk, New York, running the Advanced Interactive
Executive (AIX) operating system or LINUX operating
system.

With reference now to **Figure 3,** a block diagram
20  illustrating a data processing system is depicted in which
the present invention may be implemented.   Data processing
system **300** is an example of a client computer.   Data
processing system **300** employs a peripheral component
interconnect (PCI) local bus architecture.   Although the
25  depicted example employs a PCI bus, other bus
architectures such as Accelerated Graphics Port (AGP) and
Industry Standard Architecture (ISA) may be used.
Processor **302** and main memory **304** are connected to PCI
local bus **306** through PCI bridge **308**.   PCI bridge **308** also
30  may include an integrated memory controller and cache
memory for processor **302**.   Additional connections to PCI
local bus **306** may be made through direct component

interconnection or through add-in boards.  In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component

5    connection.  In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots.  Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and

10   additional memory **324**.  Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

15       An operating system runs on processor **302** and is used to coordinate and provide control of various components within data processing system **300** in **Figure 3**.  The operating system may be a commercially available operating system, such as Windows 2000, which is available from

20   Microsoft Corporation.  An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system **300**.  "Java" is a trademark of Sun

25   Microsystems, Inc.  Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

30       Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the

Docket No.    AUS920010686US1

implementation.   Other internal hardware or peripheral
devices, such as flash ROM (or equivalent nonvolatile
memory) or optical disk drives and the like, may be used
in addition to or in place of the hardware depicted in
5    **Figure 3.**   Also, the processes of the present invention
may be applied to a multiprocessor data processing
system.

As another example, data processing system **300** may
be a stand-alone system configured to be bootable without
10    relying on some type of network communication interface,
whether or not data processing system **300** comprises some
type of network communication interface.   As a further
example, data processing system **300** may be a personal
digital assistant (PDA) device, which is configured with
15    ROM and/or flash ROM in order to provide non-volatile
memory for storing operating system files and/or
user-generated data.

The depicted example in **Figure 3** and above-described
examples are not meant to imply architectural
20    limitations.   For example, data processing system **300**
also may be a notebook computer or hand held computer in
addition to taking the form of a PDA.   Data processing
system **300** also may be a kiosk or a Web appliance.

In accordance with a preferred embodiment of the
25    present invention, data processing system **300** executes a
document viewer.   The document viewer is capable of
displaying documents with background colors or images.
The document viewer includes a clarification tool that
modifies the attributes of the document to make the text
30    more visible.   Thus, if the text is obscured by .

Docket No.    AUS920010686US1

background colors or images, the clarification tool may present the document with modified attributes to make the text more visible.

5    With reference to **Figures 4A-4C**, example screens of display for a document viewer are shown in accordance with a preferred embodiment of the present invention. Particularly, with respect to **Figure 4A**, the screen comprises window **400**, including a title bar **402**, which may display the name of the application program.  Title

10    bar **402** also includes a control box **404**, which produces a drop-down menu (not shown) when selected with the mouse, and "minimize" **406**, "maximize" or "restore" **408**, and "close" **410** buttons.  The "minimize" and "maximize" or "restore" buttons **406** and **408** determine the manner in

15    which the program window is displayed.  In this example, the "close" button **410** produces an "exit" command when selected.  The drop-down menu produced by selecting control box **404** includes commands corresponding to "minimize," "maximize" or "restore," and "close" buttons,

20    as well as "move" and "resize" commands.

Document viewer window **400** also includes a menu bar **412** and navigation toolbar **414**.  Menus to be selected from menu bar **412** may include "File," "Edit," "View," "Insert," "Format," "Tools," "Window," and "Help."

25    However, menu bar **412** may include fewer or more menus, as understood by a person of ordinary skill in the art.  The navigation toolbar buttons include "Back", "Forward", "Stop", "Refresh", and "Home."  More particularly, navigation toolbar **414** may include "Clarify" button **416**.

Docket No.    AUS920010686US1

A user may select the "Clarify" button to modify the attributes of the document to make the document text more visible.

5      The document viewer window also includes a display area **418** in which the document is presented.  As can be seen in the example shown in **Figure 4A,** the document displayed in display area **418** includes a background image that obscures the text and, thus, makes the text difficult to read.

10      Turning to **Figure 4B,** document viewer window **450** includes display area **468** displaying the document with the clarification tool activated.  The clarification tool may be activated or enabled by selecting and holding "Clarify" button **466** or may be toggled on and off by

15    selecting "Clarify" button **466.**  Alternatively, the clarification tool may be enabled using menus in the menu bar or by selecting a menu item in a right-click menu, as known in the art.

      In the example shown in **Figure 4B,** the clarification

20    tool clarifies the text by presenting light color text with a dark color background.  Other methods for clarifying the text may be used, such as modifying the color of the text to a predetermined light color, removing the document background color or image, or

25    displaying an outline around the text.

      For example, with reference to **Figure 4C,** document viewer window **470** includes display area **488** displaying the document with the clarification tool activated.  In this example, the clarification tool clarifies the text

30    by removing the document background image.

      With reference to **Figure 4D,** an example screen of display for a preferences dialog window is shown in

accordance with a preferred embodiment of the present invention.   Preferences dialog window **490** includes display area **492** displaying preferences that may be selected or defined for operation of the document viewer.

5   For example, the user may select "Remove Background Color," "Remove Background Image," or "Enhance Fonts" in preferences dialog window **490**.   Furthermore, if "Enhance Fonts" is selected, the user may select to outline the fonts.   The user may also define a font color and a

10   background color to ensure that the text is displayed on a background with contrasting colors, thus making the text more readable.

**Figures 5A-5C** illustrate example documents in accordance with a preferred embodiment of the present

15   invention.   Particularly, **Figure 5A** illustrates an example HTML document as it is retrieved from storage or from a server.   The BACKGROUND attribute in the BODY tag sets a background image as "background.gif."   The background image may be the image shown in **Figure 4A,**

20   wherein default black text may be difficult to read with the designated background image.   The BODY tag may also designate a color, text color, link color, etc.   For example, the BODY tag may include a BGCOLOR attribute. Text may be difficult to read if text color is set too

25   close to the color of a background image or background color.

**Figure 5B** illustrates an example HTML document that is modified to remove the background image.   The BACKGROUND attribute is removed from the BODY tag.   The

30   resulting document may be similar to that shown in **Figure 4C.**   In an alternative implementation, user preferences may be set to modify text color to make the text more

visible with respect to a background image or color.  As shown in **Figure 5C**, the BODY tag is modified to include a TEXT attribute to designate a text color.

      **Figure 6** is an exemplary block diagram of a document
5   viewing system with clarification in accordance with a preferred embodiment of the present invention.  Document viewing system **600** includes a controller **602**, a display interface **604**, a user interface **606**, a communications interface **608**, a document viewer **610**, and a clarification
10  tool **612**.  The elements **602-612** may be implemented as hardware, software, or a combination of hardware and software.  In a preferred embodiment, the elements **602-612** are implemented as software instructions executed by one or more processors.

15      The elements **602-612** are coupled to one another via the control/data signal bus **620**.  Although a bus architecture is shown in **Figure 6,** the present invention is not limited to such.  Rather, any architecture that facilitates the communication of control/data signals
20  between elements **602-612** may be used without departing from the spirit and scope of the present invention. The controller **602** controls the overall operation of the document viewer and orchestrates the operation of the other elements **604-612**.

25      With the operation of the present invention, document viewer **610** instructs controller **602** to display a document via display interface **604**.  The user interacts with the document viewer via user interface **606**. Clarification tool **612**, when enabled, clarifies text in a
30  displayed document so that the text is more visible. Document viewer **610** may retrieve documents from a remote

Docket No.    AUS920010686US1

location.   For example, the document viewer may be a Web
browser.   Thus, document viewing system **600** may receive
documents to display from communications interface **608**.

5       In accordance with a preferred embodiment of the
present invention, clarification tool **612** modifies
attributes of a document presented by document viewer
**610**.   The manner in which the document attributes are
modified may be defined by the user using the user
interface.   The user may select a clarification

10      preferences, such as text color and background color,
text color and outline color, whether to remove the
background image, etc.   These parameters may be stored in
preferences **614** and clarification tool **612** may use the
preferences to determine the attributes for the displayed

15      document.

        The clarification tool may be a plugin for a Web
browser application or other document viewing
application.   Clarification tool **612** may modify a
document by creating an intermediate modified document.

20      The modified document may exist in memory or may be
cached so the document viewer does not need to have the
attributes modified every time the document is displayed.
For example, if the document viewer is a Web browser,
clarification tool **612** may be a proxy server that

25      modifies documents before they are passed to the Web
browser.   Thus, Web pages may be modified by the
clarification tool and cached.   When a user returns to a
page by hitting the "Back" button, for example, the
modified document may be displayed without retrieving the

30      document again.

        Turning next to **Figure 7**, a block diagram of a
browser program is depicted in accordance with a

preferred embodiment of the present invention.  A browser
is an application used to navigate or view information
or data in a distributed database, such as the Internet
or the World Wide Web.

5       In this example, browser **700** includes a user
interface **702**, which is a graphical user interface (GUI)
that allows the user to interface or communicate with
browser **700**.  This interface provides for selection of
various functions through menus **704** and allows for

10   navigation through navigation **706**.  For example, menu **704**
may allow a user to perform various functions, such as
saving a file, opening a new window, displaying a
history, and entering a uniform resource locator (URL).
Navigation **706** allows for a user to navigate various

15   pages and to select web sites for viewing.  For example,
navigation **706** may allow a user to see a previous page or
a subsequent page relative to the present page.
Preferences such as those illustrated in **Figure 7** may be
set through preferences **708**.  Graphical user interface

20   **702** also includes clarification tool **750** for modifying
document attributes to make the document text more
visible.

Communications **710** is the mechanism with which
browser **700** receives documents and other resources from a

25   network such as the Internet.  Further, communications
**710** is used to send or upload documents and resources
onto a network.  In the depicted example, communication
**710** uses HTTP.  Other protocols may be used depending on
the implementation.  Documents that are received by

30   browser **700** are processed by language interpretation **712**,
which includes an HTML unit **714** and a JavaScript unit

**716.**   Language interpretation **712** will process a document for presentation on graphical display **718**.   In particular, HTML statements are processed by HTML unit **714** for presentation while JavaScript statements are

5   processed by JavaScript unit **716**.

Graphical display **718** includes layout unit **720**, rendering unit **722**, and window management **724**.   These units are involved in presenting web pages to a user based on results from language interpretation **712**.

10   Browser **700** is presented as an example of a browser program in which the present invention may be embodied. Browser **700** is not meant to imply architectural limitations to the present invention. Presently available browsers may include additional functions not shown or

15   may omit functions shown in browser **700**.   A browser may be any application that is used to search for and display content on a distributed data processing system.   Browser **700** may be implemented using known browser applications, such Netscape Navigator or Microsoft Internet Explorer.

20   Netscape Navigator is available from Netscape Communications Corporation while Microsoft Internet Explorer is available from Microsoft Corporation.

With reference now to **Figures 8** and **9**, flowcharts illustrating the operation of a document viewer are shown

25   in accordance with a preferred embodiment of the present invention.   Particularly, with respect to **Figure 8**, the process begins and retrieves a document (step **802**). Then, a determination is made as to whether clarify is enabled (step **804**).   If clarify is not enabled, the

30   process displays the document (step **806**).   If clarify is enabled, the process loads preferences (step **808**) and

Docket No.    AUS920010686US1

modifies the document display based on the preferences
(step **810**).  Thereafter, the process proceeds to step **806**
to display the document.

 5    After the document is displayed, a determination is
made as to whether a new document is to be loaded (step
**812**).  If a new document is to be loaded, the process
returns to step **802** to retrieve the document.  If,
however, a new document is not to be loaded in step **812**,
a determination is made as to whether an exit condition

10   exists (step **814**).  If an exit condition exists, the
process ends.  If an exit condition does not exist in
step **814**, the process returns to step **812** to determine
whether a new document is to be loaded.

     Turning to **Figure 9**, an alternative process is

15   shown.  The process begins, retrieves the document (step
**902**), and displays the document (step **904**).  A
determination is made as to whether the clarification
tool is activated (step **906**).  If the user determines
that the text of a document is not sufficiently visible,

20   the user activates the clarification tool and the process
loads preferences (step **908**), modifies the document
display based on the preferences (step **910**) and
redisplays the document (step **912**).  Next, a
determination is made as to whether a new document is to

25   be loaded (step **914**).

     If the clarification tool is not activated in step
**906**, the process proceeds to step **914** to determine
whether a new document is to be loaded.  If a new
document is to be loaded, the process returns to step **902**

30   to retrieve the document.  If a new document is not to be
loaded in step **914**, a determination is made as to whether

an exit condition exists.   If an exit condition does not exist, the process returns to step **906** to determine whether the clarification tool is activated.   If an exit condition does exists in step **916**, the process ends.

5          Thus, the present invention solves the disadvantages of the prior art by providing a convenient tool for clarifying documents that are designed or authored with text that is difficult to read.   The clarification tool is capable of modifying document attributes so that text

10    is more visible.   The clarification tool also allows the document display to be modified based upon user preferences, thus allowing the user to define a clarification method.   In an alternative embodiment, the document may be encoded such that at least a portion of

15    the text is obscured by a background and the text cannot be read without the clarification tool.   In this embodiment, the clarification tool may also authenticate the identity of a user before modifying the attributes of the document.

20          The clarification tool overrides explicitly specified attributes for components in a document. Therefore, even if the document is poorly designed and difficult to read, the clarification tool can modify the explicitly specified attributes for enhanced display.

25    Furthermore, the clarification tool of the present invention may be especially useful for users with visual impairment, such as color blindness.   For example, while blue text on a green background might be readable to most users, a person with visual impairment may not be able to

30    read the text.   As another example, a person with a visual impairment may have difficulty reading fine print in documents.   The clarification tool of the present

Docket No.    AUS920010686US1

invention can be used to enhance the display of the fine print.

It is important to note that while the present invention has been described in the context of a fully
5    functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention
10   applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution.  Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and
15   transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions.  The computer readable media may take the form of coded
20   formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the
25   invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art.  The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of
30   ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.